ABSTRACT

Key words: peanuts, mutant lines, mutagenesis

Peanuts (groundnuts, American peanuts) have particular importance due to their high beans protein content (25-34%) and fat (45-60%). In the world oil production, peanuts are on the third place (with more than 3 million tons per year), after soybean, sunflower and before cotton.

The doctoral thesis entitled "Researches regarding the effect of different mutagens on the ground peanuts (*Arachis hypogaea* L.) has two parts and summarizes seven chapters. In the first part there are described the *Arachis hypogaea* L. species, the mutagens used and also the actual state of researches, regarding the ground peanut plant breeding. The second part presents the material and research method, the natural and institutional environment of the researches and the results and conclusions.

Chapter I – ***The ground peanut crop(Arachis hypogaea* L.)***–presents the history and biological and technological particularities of the ground peanuts. This species is part of the *Fabaceae* family and is an annual, cultivated plant. The plant has swivel root, branched erect stem, compound leaves, of two pairs of oposite leaflets, the flowers are grouped in racemes, the fruit is an indehiscent pod.

In chapter II– ***The mutagen agents description*** –are presented the action and the effect of ethylmethanesulfonate, dimethyl suphate and sodium azide on organisms.

Chapter III – intends to present the **actual stage of researches regarding the *effect of the mutagens on the morphological and physiological traits***. The documentation carried out revealed the fact that, in Romania, there are very few researches regarding the plant breeding of the *Arachis hypogaea* L. species.

In Chapter IV are presented the objectives and the **research material and methods used**.

The researches and the observations made between 2011 and 2014 aimed:

- to determine the plant growth and development stages in the pedo climatic conditions of the Moldova region;
- to induce mutations using chemical substances, in order to increase the variability of the *Arachis hypogaea* L. species;
- to study the effect of some chemical mutagen substances on the morphological and physiological particularities of the *Arachis hypogaea* L. species;
- to assess the behavior of some mutants regarding the identification of valuable biological material, with high productivity.

The biological material used in the researches (*Târnăveşti, Jelud* and *Braziliene negre* varieties and the *L 9184* line*)* was provided by the Faculty of Agriculture from the University of Craiova.

The mutagens used for the variability induction are the ethyl methane sulphonate, the dimethyl suphate and the sodium azyde. The ethyl metanesulphonate and the dimethil sulphonate had concentrations of 0,2%, 0,4%, 0,6% and 0,8%, and the sodium azide was used in concentrations of 0,02%, 0,04%, 0,06% and 0,08%, each of them with 6 h time of action.

The field experiment was carried out using the randomized blocks method, with three repetitions, near the untreated control.

In the laboratory, there was assessed the chemical sensibility of the *Arachis hypogaea* L. species, by determining the capacity and the germination energy, and also the length growing of roots and stems.

For the cytological and genetic investigations, there were used root meristems, obtained from the beans germination, that were used later for obtaining the microscope slides, following the Feulgen method.

Using those cytological and genetic methods, there were determined the mitotic index and the cromosomic aberration frequency in the mitosis.

During the vegetation period, until the maturity stage, the plants from the M_1 and M_2 generations were summited to observations and determinations regarding:

- the emergence percent of the plants;
- plant height;
- number of main branches on plant;
- average number of pods per plant;
- average number of beans per pod;

- thousand grain mass;
- average weight of beans per plant;
- percent of plant field surviving.

There were also assessed the photosynthesis intensity and the assimilation pigments content.

The pigment content was determined during the vegetation period using the spectrophotometric method, at the Physiology Department from the USAVM of Iasi. The photosynthesis intensity was determined in the field using the LCpro^{+}equipment.

The significances of the differences between the treated variants and the control were determined using the LSD method (LSD 5%, 1%, 0,1%).

For the M_3 generation there was made a characterization of the descendants, regarding the plant height, number of main branches, average number of pods per plant, average weight of beans per plant and thousand grain mass. Thus, there were determined the average values of the quantitative traits and the variability coefficient (s%).

Chapter V –***The natural and institutional environment of the researches***- summarizes information regarding the relief, vegetation and soil of the Ezareni Farm, the L.E.C.O.M. description and the climatic conditions registered between 2012 and 2014.

Chapter VI – ***Results and discussion*** – presents the results obtained following the researches that were carried out. It is divided into various chapters regarding: the sensitivity of the species to the mutagen treatments, the cytogenetic effects inducted by those treatments, the results obtained in the $M_1$and M_2generations and the M_3 characterization.

Following the analysis regarding the sensitivity of the *Arachis hypogaea* L. species to the mutagen treatments, it was noticed that, in the same experimental conditions, the germination energy and also the root and stems length growing depend on the type of the substance used and its' concentration.

The mitotic index analysis revealed that the highest mutagen effect on the reduction of this value was recorded for the sodium azyde treatments, followed by the ones with methane sulphate and the dimethyl sulphate. The mitotic index decreases with the decrease of the concentration of the substances.

The biometrical traits taken into study for the M_1 and M_2showed different levels of variability under the influence of the treatments, compared to the untreated control, with significant, distinctly significant and very significant statistically differences.

The analysis of the morphological traits from the M_1 generation revealed that the ethyl methanesulphonate and sodium azyde treatments reduced the emergence of the plants, the

plant height, average number of main branches, number of pods per plant, average number of beans per plant, number of surviving plants, average weight of beans per plant and thousand grain mass.

The lowest frequency of the mutations in the M_2 generation was noticed following the dimethyl sulphate treatments, and the highest, following the ethyl methanesulphonate and sodium azyde.

Regarding the chlorophyll pigments of the plant material, the highest values were recorded in the flowering stage, and the lowest, in the beans maturation stage. Thus, the highest content of chlorophyll pigments was recorded for the *L 9184* line, following the ethyl methanesulphonate treatments, with 0,4% concentration, in the flowering stage. The lowest value was recorded for the same line, following the ethyl methanesulphonate treatments, with 0,6% concentration, in the beans maturation stage.

The highest content of carotenoid pigments was identified for the *Braziliene negre* variety, for the dimethyl sulphate treatment in a 0,6% concentration, at the beans maturation stage. The lowest content of carotenoid pigments was found for the *L 9184* line, after the sodium azyde treatment, with 0,06% concentration in the leaves growing stage.

Regarding the ratio of the a and b chlorophyll, for the biological material taken into study, the maximum value is recorded in the beans maturation stage.

The photosynthesis reached the highest value in the flowering stage, for the plants treated with dimethyl sulphate, followed by the ones treated with sodium azyde and ethyl methanesulphonate.

There were also made physiological and cytogenetic researches, in order to identify a new variety. For the species taken into study, the mutagen treatments proved to be an efficient method of increasing the genetic variability in order to obtain new biological forms.

For the M_3 generation, there were analyzed 25 lines, but only 5 presented practical importance.